# 10 Year Energy Management Plan
# From Lighting to CHP

Providing Service to Its Member Communities Since 1925

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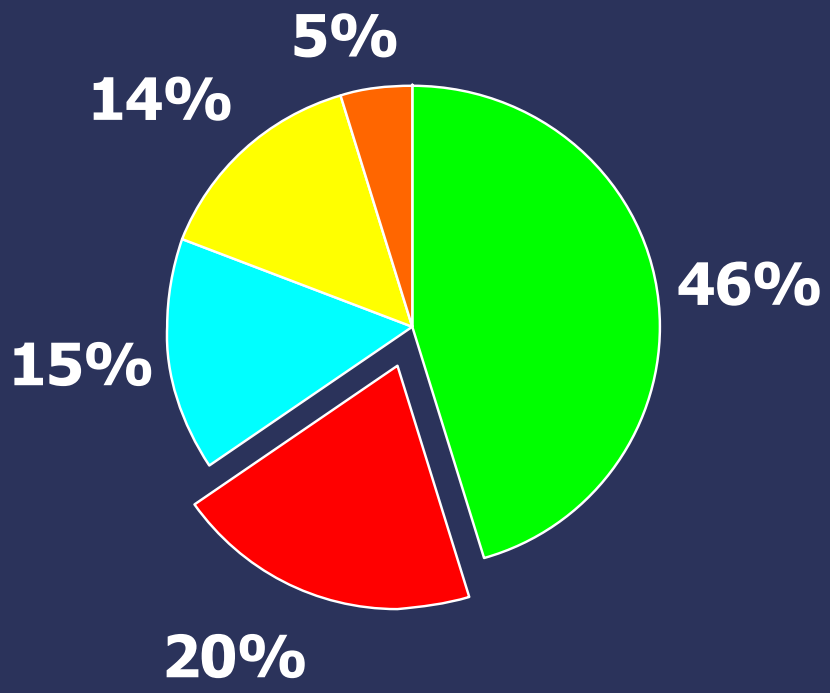
# Who is the South Essex Sewerage District (SESD)?

- 30 MGD Pure Oxygen WWTF Buried Underground
- Serving 5 surrounding communities
- Located on Salem Neck in Historic Salem, MA
- Primary Plant from M&E circa 1972, the Secondary plant is a CDM design completed in 1998. Most pumps and fans are already on VFD's.
- Facility Property is completely filled, no room for future expansion
- Outfall runs out 1.5 miles in the Atlantic

# Who is the South Essex Sewerage District (SESD)?

# Why Did SESD Start Its Energy Management Program? $$$




- Labor, Healthcare & Overhead
- Electricity and Natural Gas
- Sludge Disposal
- Maintenance Costs
- Chemicals and Water

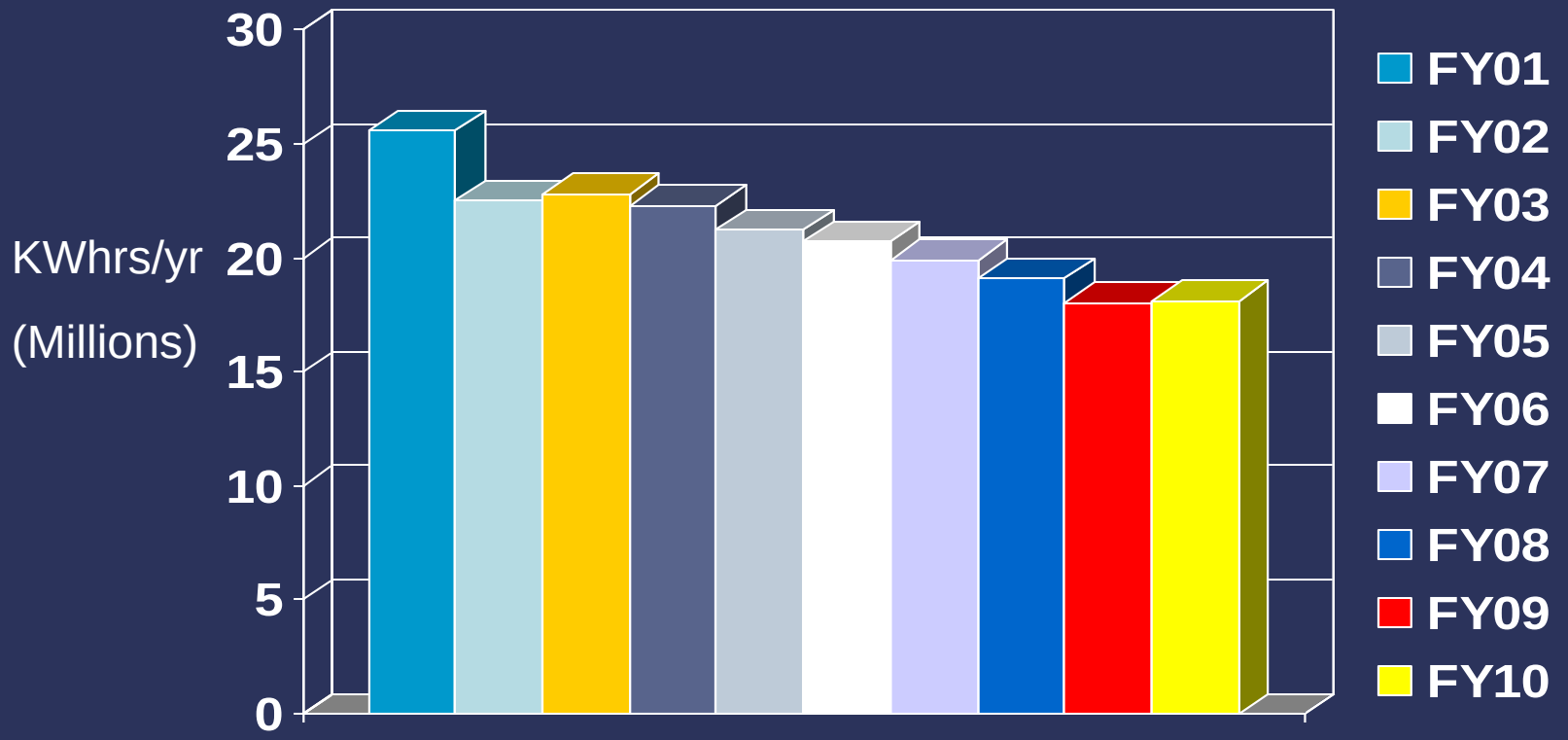
SESD O&M BUDGET BREAKDOWN

80% Fixed Cost

# How Did SESD Start Its Energy Management Program?

- Formed Energy Use and Conservation Team
- Assigned Chief Operator to HVAC/Odor Control System Monitor
- Began External Training Program for HVAC, Certified Building Operator, Certified Energy Manager
- Analyzed and Tracked annual Electricity and Natural Gas Usage, documented energy improvements
- Investigated Utility Energy Rebate & Incentive Programs as well as Revenue Generating Opportunities
- Prepared Electrical Preventative Maintenance Program, 10 Year Capital Improvement Plan and Motor Management Plan

# SESD Electric Energy Use FY01-FY10




Electrical Usage

30% Reduction!

# Electric Energy Usage Reduction Measures

- Addressed Behaviors by Making Employees Aware of Energy Conservation Efforts
- Incorporated HVAC/Lighting Space Occupancy Set Points and Controls
- Installed Outside Temperature Sensors on Heating Systems to Reduce Electric Usage During Seasonal Swing Months
- Reduced Air Flow Volumes on HVAC and Odor Control Systems and Installed VFD's
- Lowered Heating Systems Hot Water Temperatures to 160  9 months out of year

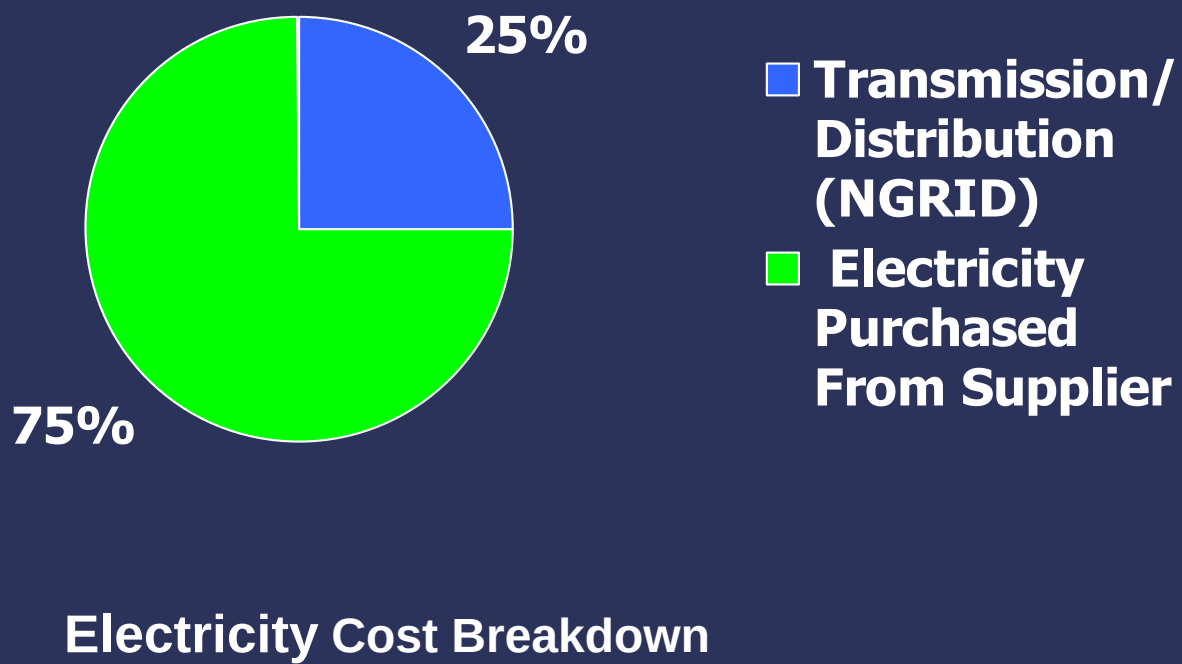
# Electric Energy Usage Reduction Measures (Cont.)

- Replaced 2,151 Existing Lighting Fixtures with High Efficiency Fixtures in 4 Phases
- Replaced 165 Exit Lighting Fixtures with LED or Self Powered Units
- Adjusted Operation of Equipment & Systems Daily and Seasonally to Minimize Energy Use
- Increased Use of Fresh Air Supply to Reduce Cooling Loads
- Installed one High Efficiency Aeration Mixer
- Optimized Vent Purity and Pressure Set Points Pure Oxygen System

# Electric Energy Cost Reduction Measures

- Went “out on market” with separate supply & transmission (National Grid) contracts
- Demand Response Program through Enernoc
- Participated in original Demand Response Pilot Program
- Increased Awareness of Capacity Charges and Management with Operations Staff
- Electric Usage and Demand Shifting From Peak to Off-Peak Times

# Purchasing of Electric Supply

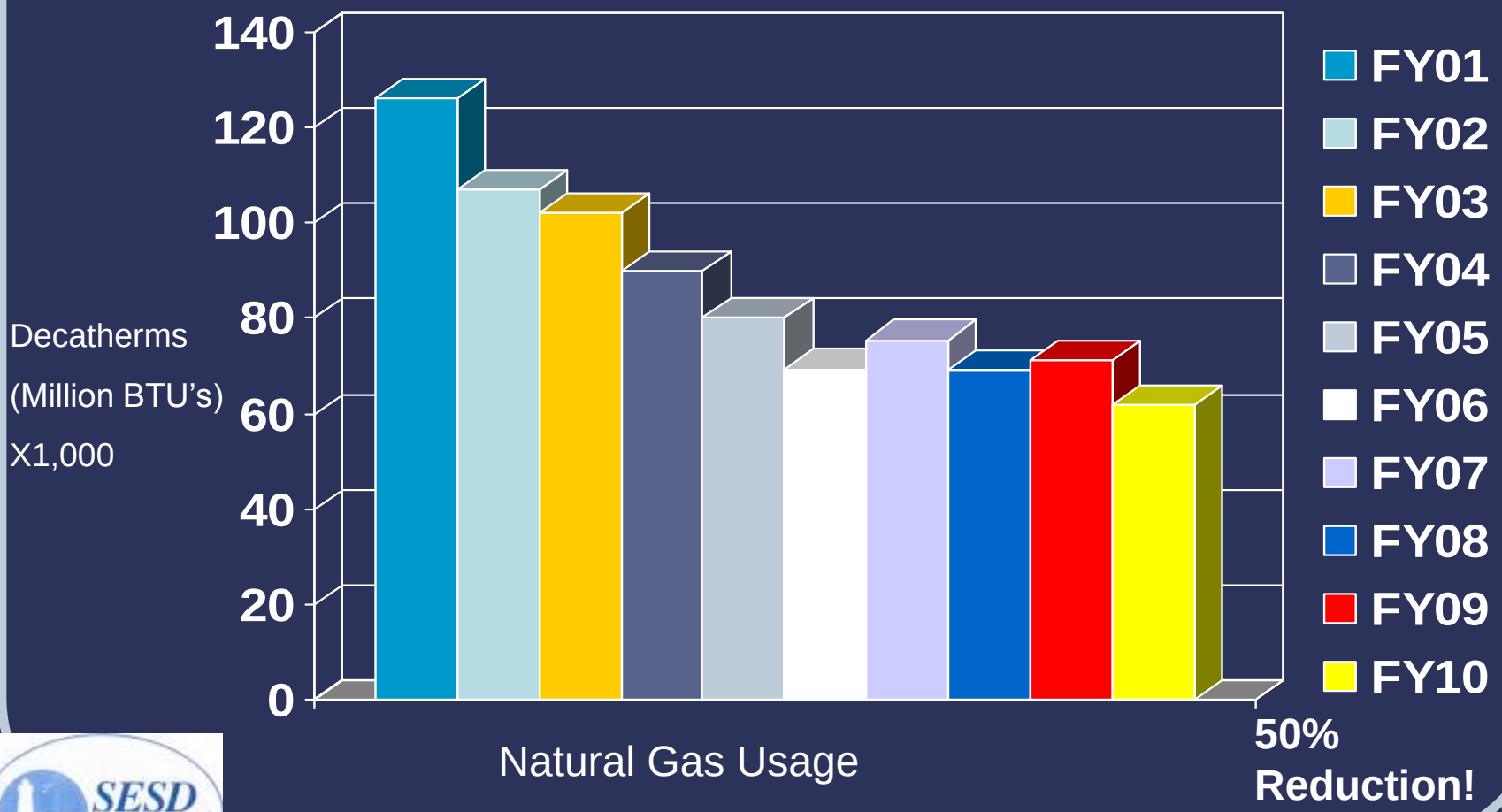



**Electricity Cost Breakdown**

# Electric Utility Rebate and Incentive Programs

- Utility Incentives for High Efficiency Aeration Mixer as well as future Mixer Installations
- Utility Incentive for Energy Efficient Lighting Replacement Projects
- Utility Incentives for Lighting Occupancy Controls
- Utility Incentives for Reduced HVAC Air Flow Volumes by Installing Variable Frequency Drives (VFD's)
- Utility Funded Rebate Program- for "NEMA Premium" Efficient Motors – "Motor-Up"

# SESD Natural Gas Use FY01-FY09



# Natural Gas Usage Reduction Measures

- Incorporated HVAC Space Occupancy Set Points and Controls.  Set Unoccupied areas to 55  F
- Installed Programmable only Thermostats in Office Building
- Installed Outside Temperature Sensors to Reduce Gas Usage During Seasonal Swing Months
- Adjusted Operation of Equipment & Systems Daily and Seasonally to Minimize Energy Use

# Natural Gas Usage Reduction Measures (Cont.)

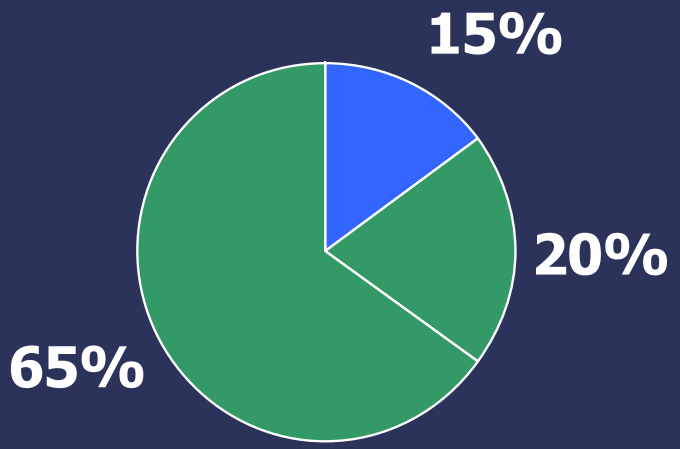
- Inspected, Maintained and Replaced Boiler Burner Controls
- Reduced Air Flow Volumes on HVAC and Odor Control Systems to Reduce Heating Load
- Installed New High Efficiency Auto-Flame Electronic Burner and Controls on Primary Boiler

# Natural Gas Cost Saving Measures

- Went “out on market” for Supplier
- Strategic Purchasing/Hedging of Natural Gas Supply at Low Price Points on the NYMEX Market
- Utility Rebate and Incentive Programs

# Purchasing of Natural Gas Supply

- Local Distribution Company (National Grid)
- Pipeline/ Storage/Transmission (Basis)
- Natural Gas (NYMEX)

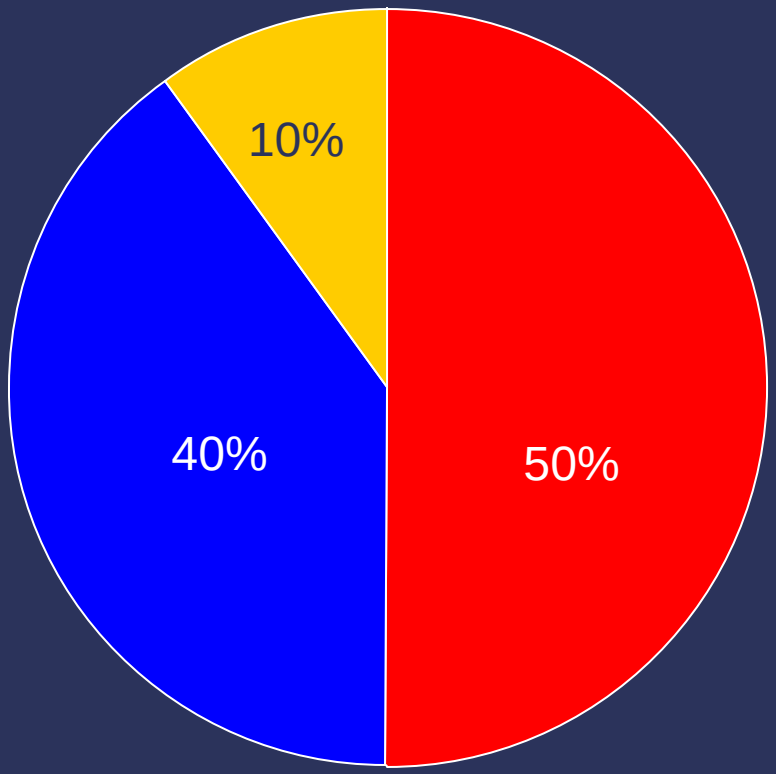



**Natural Gas Cost Breakdown**

# Natural Gas Utility Rebate & Incentives Programs

- NGRID Energy Audit Conducted Free of Charge
- Boiler Burner & Controls Upgrades
- Insulation Projects

# Where are all the Energy Cost Savings?




- Energy Use and Conservation
- Cost of Energy
- Incentives, Rebates & Demand Response Programs

**Energy Cost Savings Breakdown**

# Summary of Energy Management and Conservation Savings at SESD

- **Electricity - FY01 - FY 10**
  7,520,000 kWh @ $0.135/KWhr= $1,015,200

- **Natural Gas - FY 01 – FY10**
  61,000 Dths @ $11.1/Dth= $684,400

**Total Annual Savings = $1.7 million**
**(Avoided Annual Energy Costs)**

# Capital Energy Projects

## Capital O&M Projects

- Include Energy Savings in All Project Designs/Specifications
- Efficiency Project includes new High Efficiency Impellers in Train C of Oxygen System
- Monitor and Further Reduce Energy Usage, LED lighting, Process set points
- Monitor and Shop the Energy Supply Market to Purchase Power and Natural Gas.

# Renewable Energy Projects

## Wind Turbine Study

- Wind determined to be marginal at site (Below 12.75 mph at 80 meters)
- Project will need large turbine and significant financial assistance to be viable
- Will Re-evaluate in 5 years

## Solar Study

- Project determined to be marginal due to On-Site and Power Plant Stacks next door
- Project will need significant financial assistance to be viable
- Will Re-evaluate in 5 years

# The Big One - Co-Generation!

- Finalizing Preliminary design with AECOM for 1.5MW unit
- Cogen Projects fail because Energy Conservation measures have not been completed and there is excess heat or power
- Since our Energy Consumption has “leveled off” due to 10 years of work, we have now have a steady basis for Cogen
- Due to Odor Control needs, our facility has constant 12 month heat load and about 2.0 MW of Power Demand
- Microturbines and fuel cells not good candidates for us
- We excellent candidate for a Natural Gas-Fired Internal Combustion unit – roughly 50-50 split of power and heat
- Will tie into existing plant hot water loops with minor modifications to enhance the system
- Considering Absorption Chiller for Summer HVAC

# Questions?

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Thank you for your time